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Authors: KOCAN, RICHARD M., and PITTS, S. MARTEL

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BLOOD VALUES OF THE CANVASBACK DUCK BY AGE, SEX AND SEASON

RICHARD M. KOCAN[1] and S. MARTEL PITTS,[2] Patuxent Wildlife Research Center, Laurel, Maryland 20811, USA

Abstract: Blood samples were obtained from canvasback ducklings from Manitoba and Saskatchewan and from immature and adult canvasbacks on the Mississippi River near LaCrosse, Wisconsin and the Chesapeake Bay. These samples were used to determine baseline data on red cell counts, hematocrit, total protein, glucose, cholesterol, hemaglobin and distribution of plasma proteins. Calculations were also made to determine mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration. The major differences noted were between ducklings and adults. The former having higher total protein and lower hematocrit, glucose and cholesterol values. These hematologic values were collected in order to provide baseline information on apparently healthy canvasbacks, thereby providing disease investigators with a standard of comparison.

INTRODUCTION

Diagnosis and research of diseases rely in part on knowledge of the health both of individuals and of populations. Human and veterinary medicine use clinical data on normal physiological values to assess health, and the information is readily available. In comparison, the health state of wildlife species has received little attention. Several investigators have recently published data obtained from apparently healthy species.[6,10,16] They, as well as others,[4,11] have pointed out that age, sex, and seasonal differences may occur and should be recognized as valid differences in healthy individuals. Similarly, changes which occur during migration, reproduction, and maturation should also be considered.

Our report presents data on clinical values of cellular and chemical constituents of the blood of canvasback ducks (*Aythya valisineria*) through a representative life history in the eastern part of their range.

MATERIALS AND METHODS

Blood samples were taken from birds in southern Manitoba and Saskatchewan breeding grounds, along their southern migration route down the Mississippi River to LaCrosse, Wisconsin, and on their Chesapeake Bay wintering grounds.

Samples were taken from the jugular vein with heparinized syringes and processed within 6 hrs whenever possible. When longer storage was necessary, samples were either centrifuged and the plasma frozen or sodium fluoride (0.1%) added to inhibit glycolysis and stabilize glucose levels.

Ducklings (juveniles <66 days) were aged by the method of Dzubin.[5] Adults (>1 year) and immatures (<1 year but >66 days were caught by night lighting from a boat on the Mississippi River and bait trapping on the Chesapeake Bay. Blood was collected immediately after capture to avoid undue trauma to the birds and possible alteration of blood values.

[1] Department of Pathology SM-30, School of Medicine, University of Washington, Seattle 98195, USA.

[2] National Institutes of Health, 900 Rockville Pike, Bethesda, Maryland 20014, USA.

A Coulter Counter® Model B was used for red cell counts (RBC) while packed cell volume (PCV) were determined on an International micro-capillary centrifuge (Model MB).

Hemoglobin (Hb) values were obtained using the cyanmetheglobin method.[14] Readings were taken following removal of the red cell nuclei by centrifugation. Plasma glucose (Glu) was determined by the method of Dubowski,[8] and total plasma protein by the Biuret method.[14] The method of Babson *et al.*[3] as modified by Mann[12] was used for cholesterol (Chol) determination.

Plasma proteins were electrophoretically separated on Sepraprare III® Acetate strips in Gelman® high resolution barbitol buffer at 400 V for 60 min. The strips were stained with Ponseau S protein stain and per cent total protein quantified on a Densicard® electrophoresis densitometer-552 (Photovolt Corporation, New York).

RESULTS

The major differences encountered were between ducklings and adults and between migrating and wintering adults. Blood chemical values varied little between adult and immature birds and were recorded by sex only.

Tables 1 and 2 summarize the cellular and chemical values obtained from all age classes of canvasbacks. Red cell counts and hemoglobin values were not obtained from ducklings due to our inability to store cellular components and inadequate facilities in the field for instrumentation.

Mid-migration and early winter arrivals on the Chesapeake Bay had RBC levels slightly lower than wintering birds. This difference did not appear to hold true for PCV or Hb levels. Insufficient cholesterol samples were collected for meaningful comparisons.

Four to 10 week-old ducklings had lower mean PCV, glucose and cholesterol than most of the adults. However, total protein tended to be slightly higher than in adults.

Table 3 summarizes the values obtained for plasma protein fractions from all ages and sexes. Juveniles (<66 days) had lower values of prealbumin (83%), alpha-2 (28%), and beta globulin (22%) than adults (>1 yr) and immatures (>66 days). All other values were similar.

Beta-2 was not readily distinguishable and is therefore included in the fibrinogen value. In the few samples where it was recognizable the values ranged from 4 to 5%. Fibrinogen values therefore should be considered 4 to 5% lower than the values presented in the table.[10]

TABLE 1. Summary of mean packed cell volume (PCV), total protein (TP), glucose (Glu) and cholesterol (Chol) values of canvasback ducklings trapped in Manitoba and Saskatchewan.

Age class (days)	PCV %	TP gm/100 ml	Glu mg/100 ml	Chol mg/100 ml
26-32	45 ± 3.1*	4.9 ± 1.1	230 ± 100	186 ± 47
n	9	9	9	6
33-42	44 ± 5.2	4.6 ± 1.1	279 ± 82	229 ± 43
n	15	15	15	6
43-53	44 ± 5	5.5 ± 1.2	306 ± 76	143 ± 25
n	22	22	22	6
54-65	46 ± 4.8	6.1 ± 0.9	272 ± 26	123 ± 15
n	4	4	4	3

* ± = standard deviation

TABLE 2. Summary of mean hematologic data from canvasbacks from November through March.

Collection site and date	Sex	RBC X $10^6/mm^3$)	PCV %	Hb gm/100 ml	MCV μ^3	MCH $\mu\mu g$	MCHC %	TP gm/100 ml	mg/100 ml Glu	Chol mg/100 ml
Mid-migration	male	2.63 ± 0.2	55 ± 1.3	16.6 ± 0.9	209	63	30	4.4 ± 0.9	241 ± 38	311 ± 114
Mississippi River	n =	8	8	8				14	14	6
LaCrosse, Wisc.	female	2.87 ± 0.2	58 ± 2.4	16.5 ± 1.6	202	57	28	4.5 ± 0.3	248 ± 21	313 ± 43
(November)	n =	8	7	8				8	8	8
Early winter	male	2.68 ± 0.1	52 ± 2.1	15.9 ± 0.9	194	59	30	5.3 ± 0.6	466 ± 112	— —
Chesapeake Bay	n =	2	2	2				7	7	—
(November)	female	3.01 ± 0.12	56 ± 2.1	17.5 ± 0.6	186	58	31	5.5 ± 0.5	473 ± 76	— —
	n =	2	2	2				7	7	—
Mid-winter	male	2.99 ± 0.17	56 ± 2.9	17.4 ± 0.7	187	58	31	5.7 ± 1.1	382 ± 110	298 ± 38
Chesapeake Bay	n =	9	9	9				9	9	9
(December-January)	female	2.96 ± 0.25	55 ± 4.2	16.7 ± 1.1	186	56	30	4.8 ± 0.5	345 ± 102	316 ± 50
	n =	29	29	25				38	38	10
Late winter	male	3.09 ± 0.3	52 ± 5.7	15.6 ± 1.4	168	50	30	4.2 ± 0.6	264 ± 46	— —
(Chesapeake Bay)	n =	18	18	18				18	18	—
(February-March)	female	3.28 ± 0.23	54 ± 3.2	15.5 ± 1.7	165	47	29	4.3 ± 0.9	212 ± 32	— —
	n =	11	11	11				11	11	—

TABLE 3. Mean percent and actual total plasma protein values of both sexes of adult and juvenile canvasbacks.

Sex/age	Pre-albumin	Albumin	Alpha-1	% / Grams Alpha-2	Beta	Fibrinogen*	Gamma
26-32 days	1.9 ± 0.52	46.2 ± 5.3	7.3 ± 2.1	8.4 ± 3.5	16.8 ± 1.7	13.8 ± 1.7	6.1 ± 1.6
n = 6	0.09	2.26	0.36	0.41	0.82	0.67	0.29
33-42 days	1.7 ± 0.64	48.8 ± 3.9	5.1 ± 0.76	6.2 ± 1.23	15.6 ± 0.47	16.4 ± 2.1	6.3 ± 1.39
n = 6	0.08	2.24	0.23	0.28	0.71	0.75	0.29
43-53 days	1.7 ± 0.66	50.2 ± 4.5	6.8 ± 2.1	8.0 ± 1.76	14.8 ± 1.48	12.8 ± 1.9	5.6 ± 1.55
n = 6	0.09	2.76	0.37	0.44	0.81	0.70	0.31
54 - 65 days	1.2 ± 0.68	49.8 ± 1.89	7.0 ± 2.45	5.1 ± 0.47	14.3 ± 1.10	14.6 ± 1.1	8.1 ± 0.7
n = 3	0.07	3.06	0.43	0.31	0.87	0.89	0.49
A male	11.2 ± 4.7	48.4 ± 1.8	4.8 ± 0.31	5.2 ± 0.52	11.7 ± 1.2	12.8 ± 2.03	5.8 ± 2.2
n = 15	0.51	2.23	0.22	0.24	0.54	0.59	0.27
I male	9.8 ± 2.7	52.7 ± 3.2	4.9 ± 0.67	4.6 ± 1.2	11.9 ± 1.0	11.6 ± 2.05	4.9 ± 1.4
n = 14	0.45	2.42	0.22	0.21	0.55	0.54	0.22
A female	8.1 ± 2.5	47.9 ± 1.14	7.6 ± 0.54	4.9 ± 0.83	12.9 ± 1.39	12.4 ± 2.3	6.0 ± 1.2
n = 22	0.34	2.01	0.32	0.20	0.54	0.52	0.25
I female	8.8 ± 2.7	52.9 ± 2.41	5.5 ± 1.72	5.4 ± 1.54	11.7 ± 1.25	10.9 ± 2.8	5.8 ± 2.8
n = 14	0.37	2.22	0.23	0.22	0.49	0.46	0.24

* Fibrinogen value includes 4 to 5% beta-2 globulin[10].

DISCUSSION

The differences in many of the values presented here may be due to age or condition. All values were obtained from apparently healthy individuals and therefore constitute a means of evaluating the physical condition of a population at various times of the year.

The differences observed among adult birds probably reflect hormonal and nutritional changes brought about by changing photoperiod and migration.[2,9,13] Changes in ducklings, however, are probably due to high metabolic rates associated with rapid tissue and feather growth, as well as consumption of a predominantly insectivorous diet. The tremendous demands for protein and carbohydrate derived energy during the early life of these birds could well be responsible for the observed differences in these values.

Biochemical values obtained from wild animals are not easily interpreted, due to the uncertain physiological condition of the animal at the time of sampling. Glucose and cholesterol, for instance, vary according to the absorptive state of the animal. Prolonged fasting gives the most reliable baseline data for these two constituents,[15] but fasting is impractical under field conditions. This uncertainty as to absorptive state undoubtedly accounts for the relatively wide range of glucose and cholesterol values.

Cholesterol values in adult ducks are 1 to 3 times greater than the normal values for humans and some mammals.[4] Birds and reptiles apparently have a much wider range of cholesterol values than do mammals. Values for chickens range as low as 23 to 120 mg/ml[4] and turtles as high as 500 mg/ml.[7]

The significance of many of these physiologic values remains to be determined, but the values to be expected in apparently healthy canvasbacks are useful for assessing disease conditions.

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